



English

29mm Cubic UXGA  
Analog B/W Camera

**VCC-G20U20H1**

**Product Specification**  
**& Operation Manual**

**CIS Corporation**

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## 1. Scope of Application

This is to describe VCC-G20U20H1 UXGA B/W CCD camera.  
All specifications contained herein are subject to change without prior notice.  
Reproduction in whole or in part is prohibited.

## 2. Notice

The camera must not be used for any nuclear equipments or aerospace equipments with which mechanical failure or malfunction could result in serious bodily injury or loss of human life. Our warranty does not apply to damages or defects caused by irregular and/or abnormal use of the product. Please refer to Clause 12. Handling Precautions.

## 3. Product Outline

VCC-G20U20H1 is a high-resolution industrial B/W camera module utilizing a 1/1.8-inch PS IT CCD. 2M pixels CCD image sensor with on-chip micro-lenses realizes high sensitivity and high resolution.

### Key Features

#### Sync. System

HD/VD sync. input or HD/Trigger sync. input

#### Electronic shutter

Electronic shutter speed switchable by rear panel switch  
OFF, 1/120s ~ 1/10,000s : 8 steps

Electronic shutter switchable by trigger pulse width  
1/4s ~ 1/100,000s

#### Frame rates

The followings are effective at both normal operation and trigger operation.

15 fps:	Progressive Scan
30 fps:	Signal read-out combining adjacent pixels vertically. (Binning)
30 fps:	1/2 SCAN Partial Scan Operation
60 fps:	1/4 SCAN Partial Scan Operation
90 fps:	1/6 SCAN Partial Scan Operation

#### Trigger Operation

Sync reset trigger operation

Single VD input trigger operation (Waiting for the single VD input and reset the sync.)

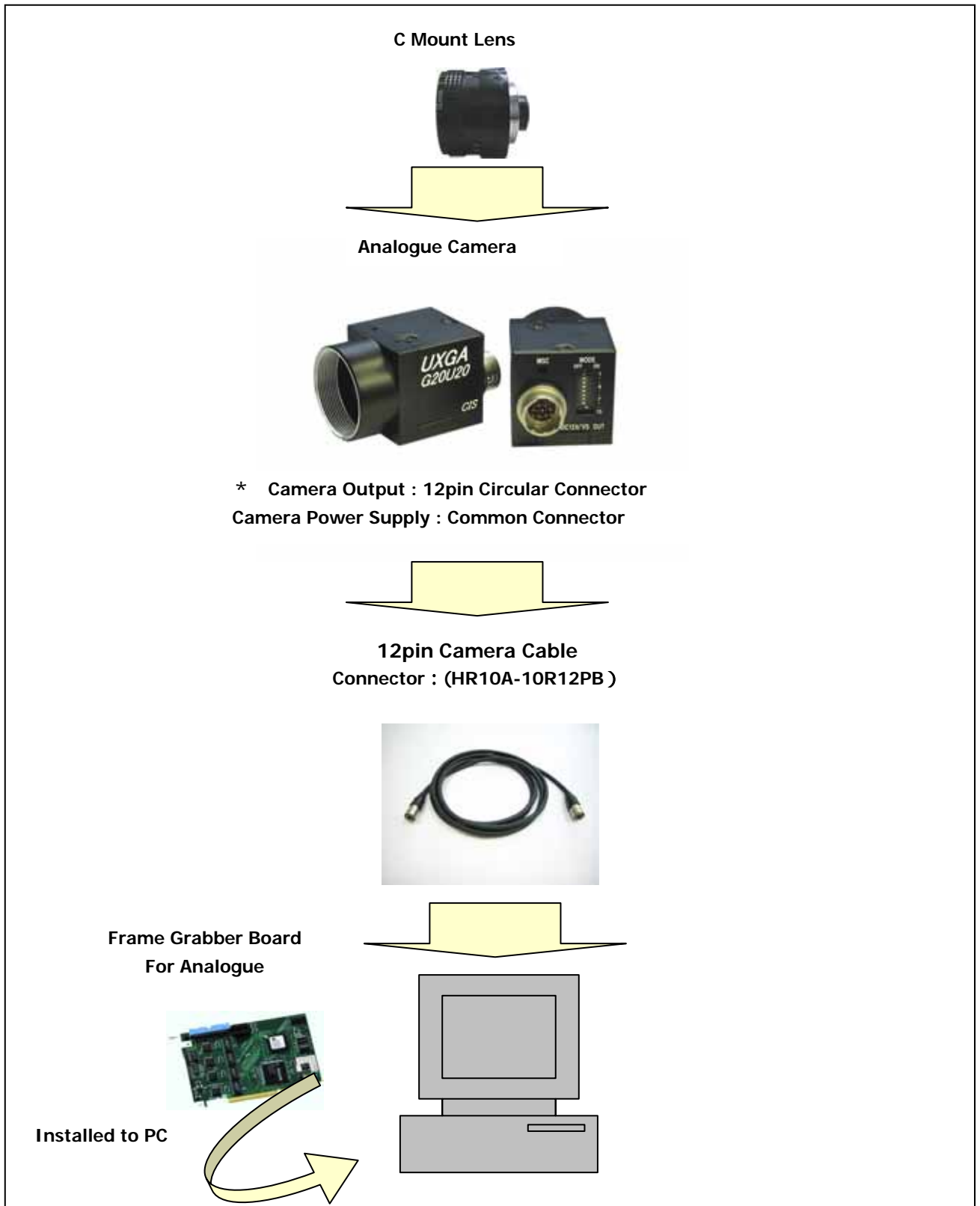
#### AGC optional function

=0.45, 75 terminal settings can be set as the factory optional settings.

#### 29mm Cubic in size

Its small size, 29mm cubic, and light weight, 44g, makes it a best match for use in embedded systems for image calibration and microscopic applications.

4. System Connection Diagram



## 5. Specification

### 5.1. General Specification

Item	Specification	Remarks
Power consumption	2.4 W (Max. 2.8W)	
Power requirements	DC +12V ± 10%	
Operation environment	Performance Guaranteed; 0 ~ + 40 with RH 20 ~ 80% Operation Guaranteed ; -5 ~ + 45 with RH20 ~ 80% No condensation	
Storage environment	-25 ~ + 60 with RH 20 ~ 90% No condensation	
Mass	44 g	
Dimensions	29(W) × 29(H) × 29(D)mm (not including protruding parts)	
Lens mount	C mount	
Flange back	Flange focal distance fixed 17.526mm	
Optical axis accuracy	Pixel center ±0.1 mm	
Pick up device	1/1.8" Interline Transfer B/W CCD Total pixel number 1628(H) × 1236(V) Effective pixel number 1620(H) × 1220(V) Unit cell size 4.4 μ m(H) × 4.4 μ m(V) Square pixel	ICX274AL (Sony) Progressive
Spectral response	Refer to 5.4. CCD Spectral response (representative value).	
S/N ratio	52 dB (Gain 0dB)	
Horizontal resolution	1200 TV line	
Gain	Manual 0 ~ +12 dB	
Gamma	1.0 fixed	
Sensitivity	F8 400 lx (Exposure time 1/15sec, Gain 0dB, 3200 ° K)	
Minimum illumination	F1.4 2 lx (Exposure time 1/15sec, Gain 12dB, VS 50IRE)	
Synchronization System	Internal Sync. HD/VD External Sync. Input signal level: 2 ~ 5Vp-p, TTL Input Input impedance 10K Automatically switched by HD recognition. Frequency allowance: ± 1% Jitter: under 20ns	75 terminal Depends on optional factory settings

Item	Specification	Remarks																				
Scanning system Non-interlace scan	1/15sec Progressive scan (Standard mode) Horizontal frequency 18.75 KHz Vertical frequency 14.98 Hz Pixel clock 36 MHz	1920 PCLK 1252 HD																				
	1/30sec Binning scan (Combining adjacent pixels vertically) Horizontal frequency 18.75 KHz Vertical frequency 30.00 Hz Pixel clock 36 MHz	1920 PCLK 626 HD																				
Video output signal	Analog VS output 1.0V(p-p) Sync. negative, 75 unbalanced, DC connect White clip level; 820 ± 50mVp-p Setup level; 25 ± 10mVp-p Sync level; 290 ± 30mVp-p DC level; 500 ± 100mV																					
Trigger input	Input signal Trigger signal shall be positive, rising edge. Input signal level; Low 0.5Vmax , High 4Vmin Minimum Input trigger width; over 2HD Input impedance; 1K																					
Normal shutter operation	Setting by the rear switch. OFF, 1/120, 1/300, 1/600, 1/1250, 1/2500, 1/5000, 1/10000s																					
External trigger shutter operation	Setting by the rear switch. 1/30, 1/120, 1/300, 1/600, 1/1250, 1/2500, 1/5000, 1/10000s Approx. 1/4sec ~ 1/100,000sec (at trigger pulse control) Exposure time will be fluctuated by 1HD because of the caused jitter between internal HD and trigger pulse width. To avoid this fluctuation, add HD to synchronize.	HD input is recognized automatically.																				
Partial Scan operation	<table border="1"> <thead> <tr> <th></th> <th>V scanning line</th> <th>Rate</th> <th>Effective V line</th> </tr> </thead> <tbody> <tr> <td>OFF Progressive</td> <td>1252 lines</td> <td>15 fps</td> <td>1220 lines</td> </tr> <tr> <td>1/2 Scan</td> <td>626 lines</td> <td>30 fps</td> <td>557 lines</td> </tr> <tr> <td>1/4 Scan</td> <td>313 lines</td> <td>60 fps</td> <td>218 lines</td> </tr> <tr> <td>1/6 Scan</td> <td>209 lines</td> <td>90 fps</td> <td>106 lines</td> </tr> </tbody> </table>		V scanning line	Rate	Effective V line	OFF Progressive	1252 lines	15 fps	1220 lines	1/2 Scan	626 lines	30 fps	557 lines	1/4 Scan	313 lines	60 fps	218 lines	1/6 Scan	209 lines	90 fps	106 lines	
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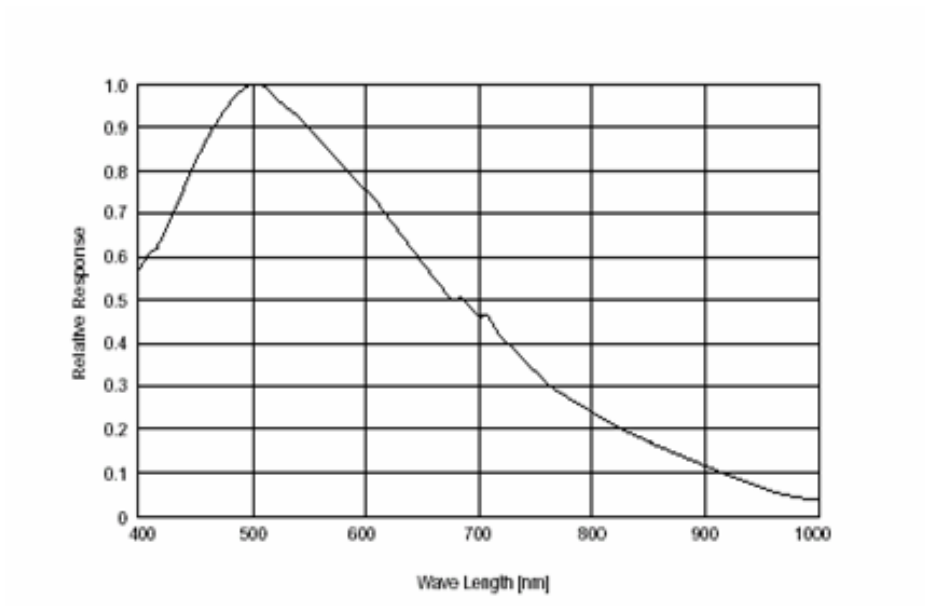
## 5.2. Durability

Item	Specification	Remarks
Vibration resistance	Acceleration            98m/S <sup>2</sup> (10G) Vibration frequency    20 ~ 200Hz Sine wave Direction                X Y Z 3 directions Testing time              20min for each direction  No malfunction shall occur after testing the above.	
Shock resistance	Acceleration            490m/S <sup>2</sup> (50G) Direction                6 directions	
Operation temperature	-5 ~ + 45 with RH 20 ~ 80% (No condensation) a) Leave the camera for 1 hour at the highest operation temperature (no condensation), turn on the power, and then the camera shall operate and meet the specifications. b) Leave the camera for 1 hour at the lowest operation temperature (no condensation), turn on the power, and then the camera shall operate and meet the specifications.	
Grounded mechanical chassis/Insulation	Mechanical chassis of VCC-G20U20H1 is grounded, therefore, use an insulated tripod adaptor when the camera shall be isolated.	

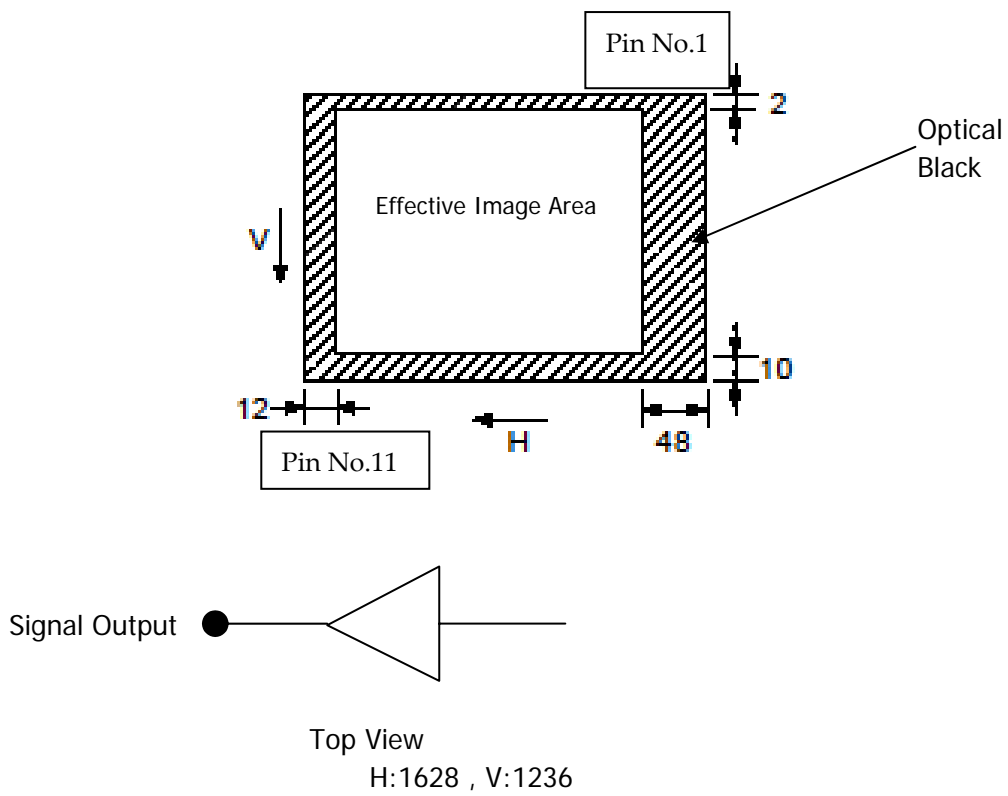
## 5.3. Safety/Quality Standards

- UL Standard  
Conform to UL standard including materials and others.
- EMC  
Conform to EN50081-2 (Emission)  
Test standard EN55022:1998 Class A  
Conform to EN50082-2 (Immunity)  
Test standard EN61000-4-2 ~ 4-6
- RoHS  
Conform to RoHS.
- FCC Compliance        TBD

### 5.4. CCD Spectral Response (Representative Value)



### 5.5. Optical Black Layout

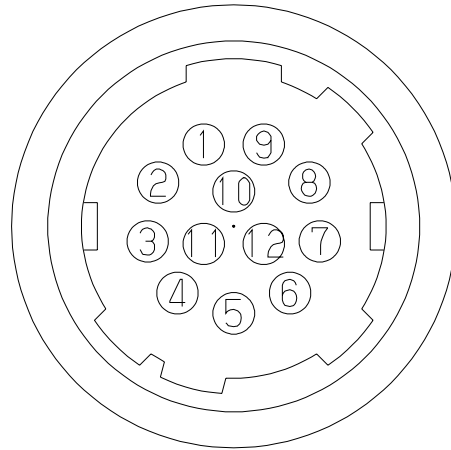




## 6. External Connector Pin Assignment

### 6.1. 12pins Circular Connector HR10-10R-12PA (73) (Hirose)

Pin No.	
1	GND
2	Power IN +12V
3	GND
4	Video Out
5	GND
6	HD In/Out
7	VD In/Out
8	GND
9	NC
10	WEN Out
11	Trigger In
12	GND



### 6.2. Switch Settings

Rear panel switch function 10bit DIP-Switch

1	E2	} Electronic Shutter Speed 3bit, 8step OFF ~ 1/10000sec
2	E1	
3	E0	
4	MODE 1	} Trigger Mode 2bit Normal, Fixed Trigger, Pulse Width Trigger 1 and 2
5	MODE 0	
6	PART 1	} Scan Mode 3bit Partial 30fps, 60fps, 90fps
7	PART 0	
8	BINNING	Binning 30fps
9	*****	Not Valid
10	IN/OUT	HD/VD Input, Output Hirose 6, 7 pin

↑  
OFF

indicates initial setting position.

Other Optional Functions (Factory Setting)

HD/VD75 terminal  
= 0.45

Please contact us for the details.

## 7. Function

Table of Settings

Function	Normal mode	Fixed Switch Trigger Mode (Sync reset)	Pulse Width Trigger Mode 1 (Sync Reset)	Pulse Width Trigger Mode 2 (Sync Non-Reset)
Fixed Switch Shutter			X	X
Pulse Width Shutter	X	X		
Vertical Binning Scan				
Vertical Partial Scan				
External HD/VD Input	HD/VD	HD	HD	HD/VD
Internal HD/VD Output				X

### Normal mode

At normal mode, the setting shall be Progressive Scan, 15 fps, trigger operation invalid.  
 HD/VD external input is valid at progressive scan, binning operation, and partial operation.

### Fixed Switch Trigger mode (Sync Reset Type)

At fixed switch trigger mode operation, 8 step shutter values can be set by fixed switch at rear.  
 Right after completion of exposure, internal sync and VD are reset and signals are read out, so that the images can be taken at the shortest timing. HD external input is valid. VD external input shall not be input. When outputting camera internal HD/VD, set the switch 10 to be OFF.

Exposure time = Value set by rear switch  
 Trigger Width; 4us ~ 250ms, Positive Logic  
 The Shortest Trigger Cycle = 1frame + 4HD

### Pulse Width Trigger mode 1 (Sync reset Type)

At pulse width trigger mode 1, shutter values can be set by trigger pulse width.  
 Right after completion of exposure, internal sync and VD are reset and signals are read out, so that the images can be taken at the shortest timing. HD external input is valid. VD external input shall not be input. When outputting camera internal HD/VD, set the switch 10 to be OFF.

Exposure time = Trigger Width (us) + 4.87us Typical  
 Trigger Width; 4us ~ 250ms, Positive Logic  
 The Shortest Trigger Cycle = 1frame + 4HD (When trigger width is less than 35.5ms)

### Pulse Width Trigger mode 2 (Sync Non-Reset Type)

At pulse width trigger mode 2, shutter values can be set by trigger pulse width.  
 After completion of exposure, external VD (single) input is waited, and then signals are read out, so that the images can be taken at any timing. The down edge phase shall be matched when inputting external HD/VD signals.

Exposure time = Trigger Width (us) + 4.87us Typical  
 Trigger Width; 4us ~ 250ms, Positive Logic  
 The Shortest Trigger Cycle = Trigger Width + Waiting time for VD + 1 Frame + 2HD  
 The next trigger shall not be input before completion of signal output of the prior trigger.

### Binning and Partial Scan Function

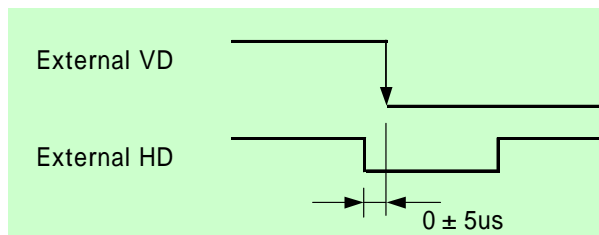
At binning scan function, vertical two lines are readout at one time. As a result, vertical resolution will be half but the readout rate and sensitivity will be double.

At partial scan function, the upper part and the lower part of vertical lines are wiped out, and only the center part are read out. As a result, frame rate will be higher.

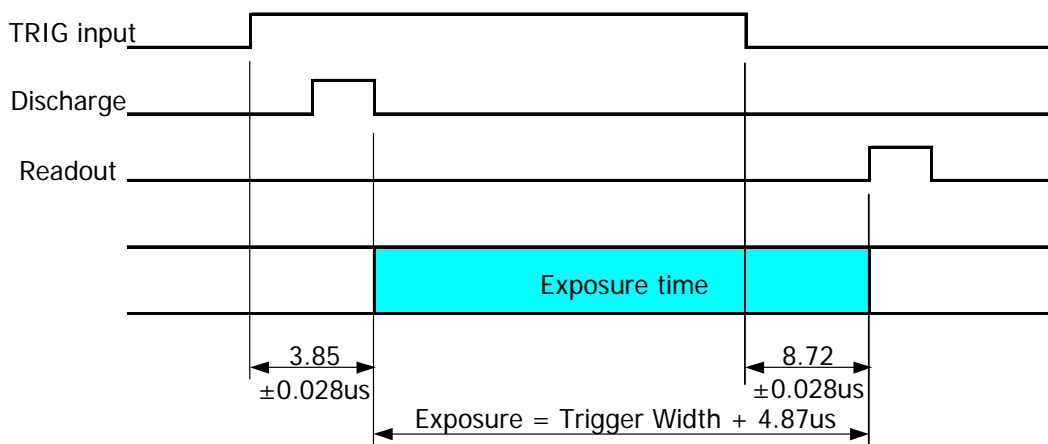
When setting shutter timing with the rear switch, it shall be set within readout rate (VD cycle).

Scanning	Frame Rate (fps)	VD Cycle (lines)	BLK Period (lines)	Effective V Area (lines)
Normal	14.976	1252	32	1220
Binning	29.952	626	24	602
1/2 Partial	29.952	626	49	550
1/4 Partial	59.904	313	62	211
1/6 Partial	89.713	209	66	99

### External HD/VD Input Phase



### Trigger signals and exposure time (Pulse width trigger operation)



Fixed Shutter Switch at rear SW1, SW2, SW3

E2	E1	E0	Shutter Value	Actual Time
1	2	3	At Normal Operation	At Trigger Operation
OFF	OFF	OFF	OFF	66.7 ms 35.5 ms
OFF	OFF	ON	1/120 sec	8.28 ms 8.82 ms
OFF	ON	OFF	1/300 sec	3.38 ms 3.61 ms
OFF	ON	ON	1/600 sec	1.67 ms 1.80 ms
ON	OFF	OFF	1/1250 sec	820 us 880 us
ON	OFF	ON	1/2500 sec	397 us 434 us
ON	ON	OFF	1/5000 sec	183 us 207 us
ON	ON	ON	1/10000 sec	77 us 91 us

Mode Selection Switch at rear SW4, SW5

MODE1	MODE0	Setting Mode
4	5	
OFF	OFF	Normal Operation
OFF	ON	Fixed Trigger Operation (Sync Reset type)
ON	OFF	Pulse Width Trigger Operation 1 (Sync Reset type)
ON	ON	Pulse Width Trigger Operation 2 (Sync Non-Reset type)

Scan Rate Selection Switch at rear SW6, SW7, SW8

SCAN1	SCAN0	BINNING	Scanning Mode
6	7	8	
OFF	OFF	OFF	Full frame Scan
OFF	ON	OFF	1/2 Scan
ON	OFF	OFF	1/4 Scan
ON	ON	OFF	1/6 Scan
OFF	OFF	ON	1/2 Scan

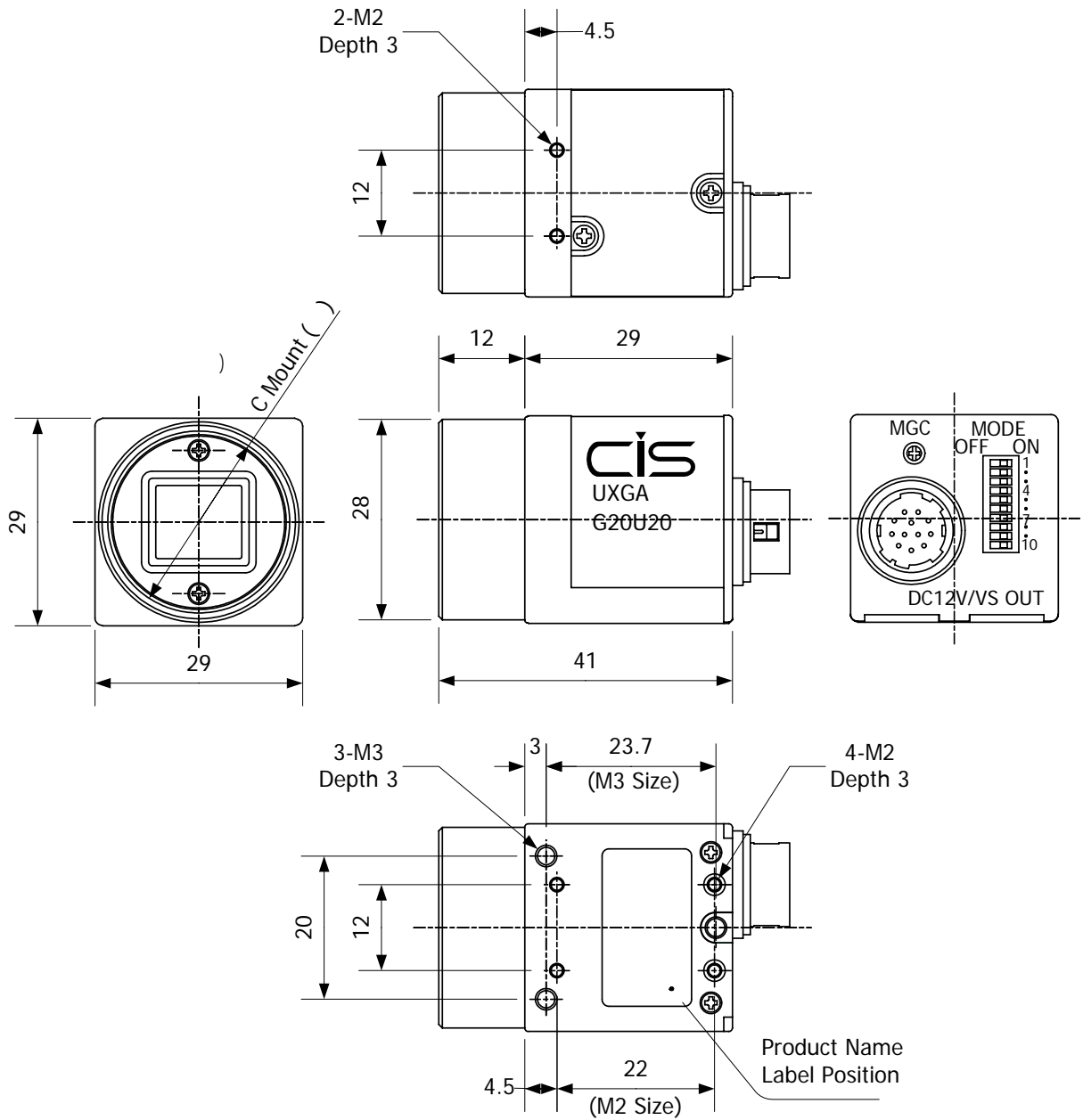
HD/VD input/output Selection

SW10	OFF	HD/VD Output	Normal Operation, Trigger Operation 1
	ON	HD/VD Input	Normal Operation, Trigger Operation 2
		HD Input	Trigger Operation 1

SW9 is invalid.

 Shows initial setting

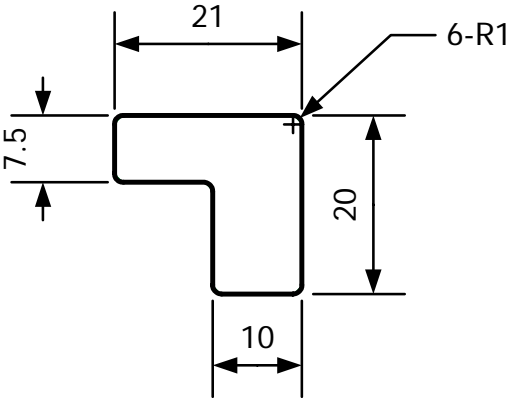
8. Dimensions



( )  
 Screw length from lens mount surface shall be under 6 mm.  
 Protruding portion shall be under 10 mm

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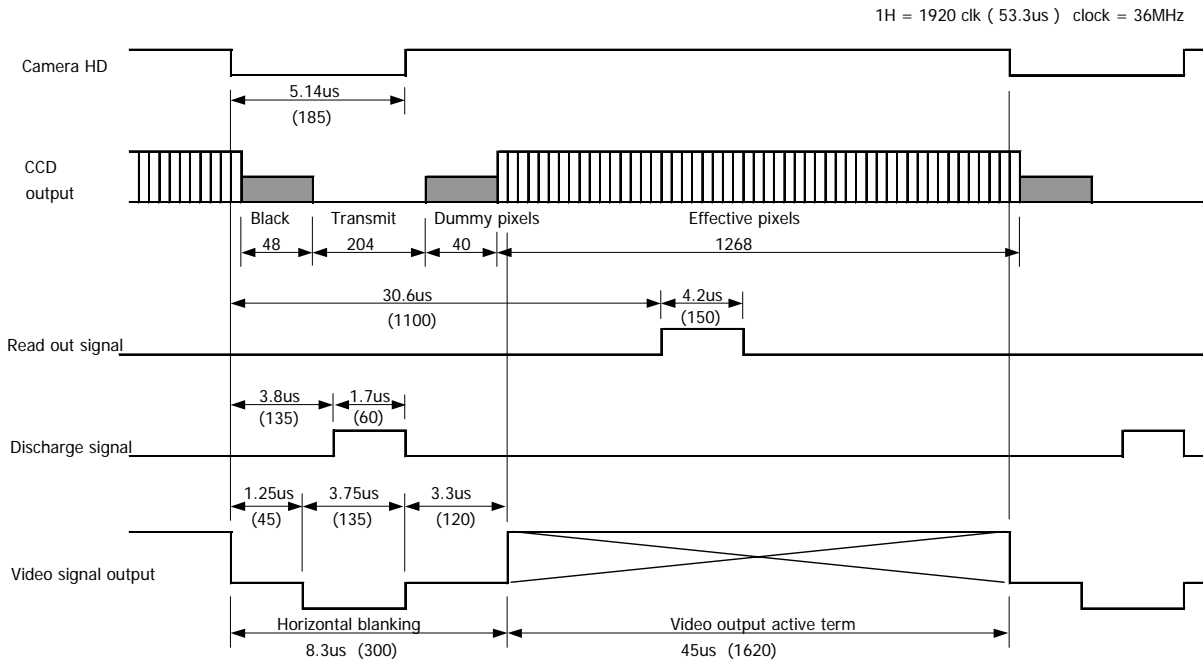
9. Covering Sticker Drawing



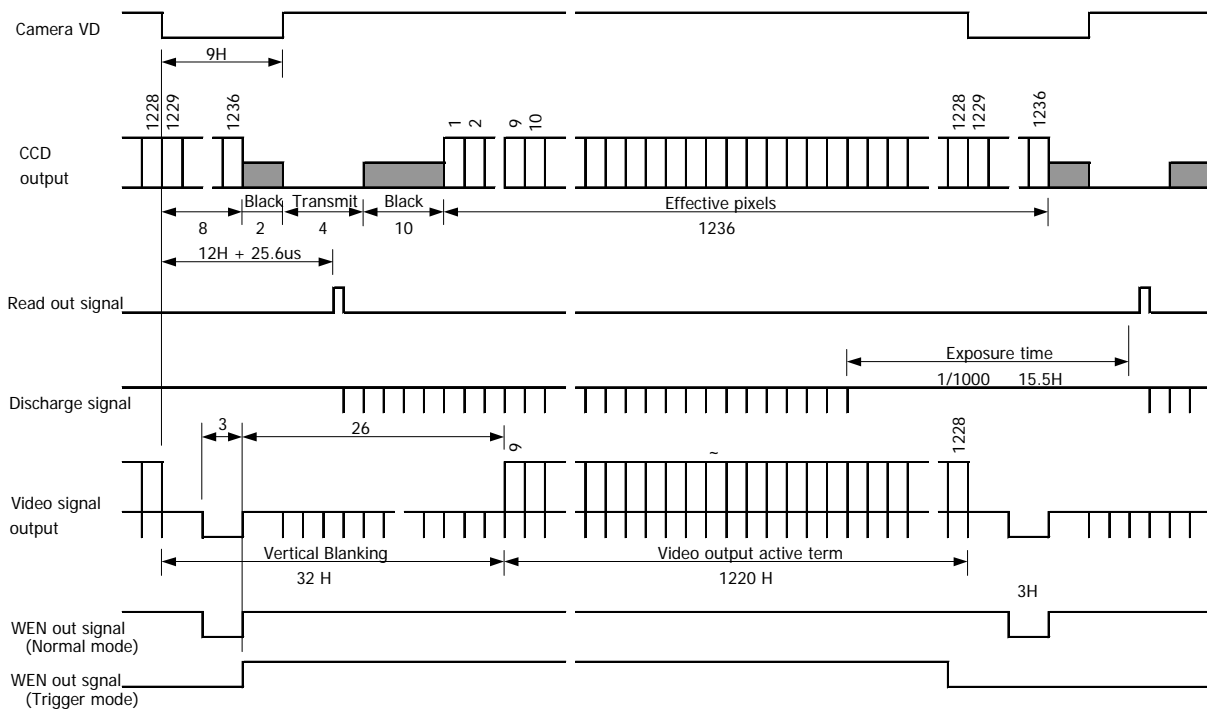
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## 10. Timing Chart

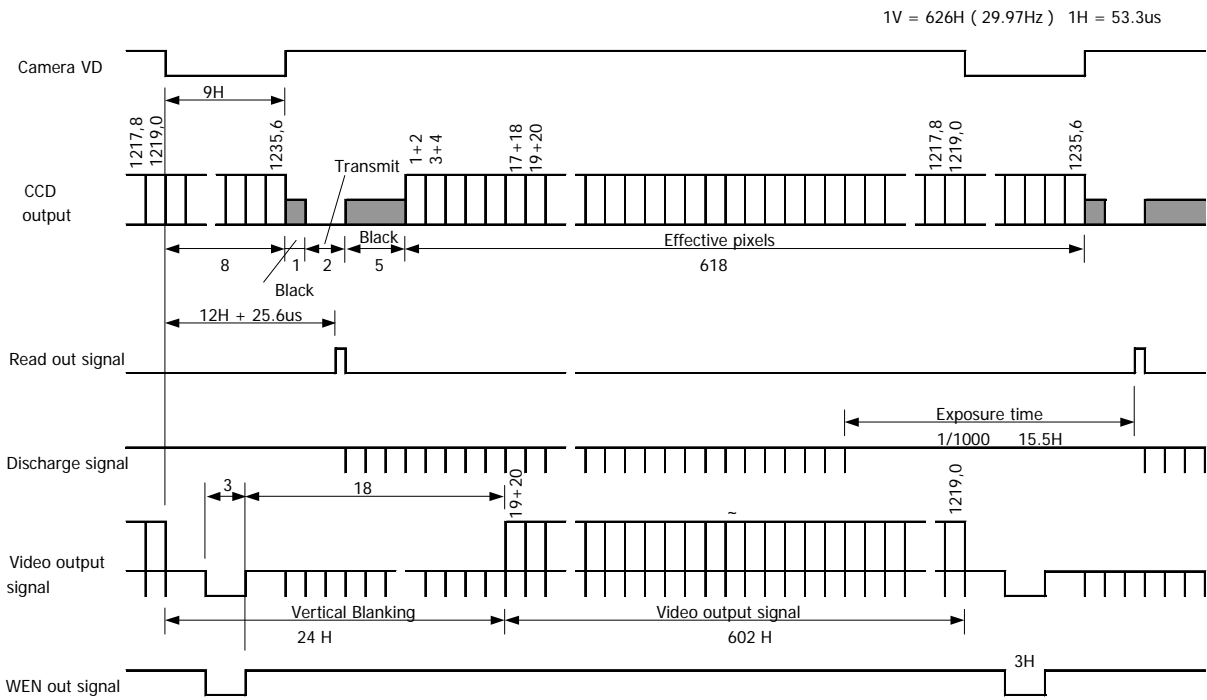
### 10.1. Horizontal Synchronous Timing



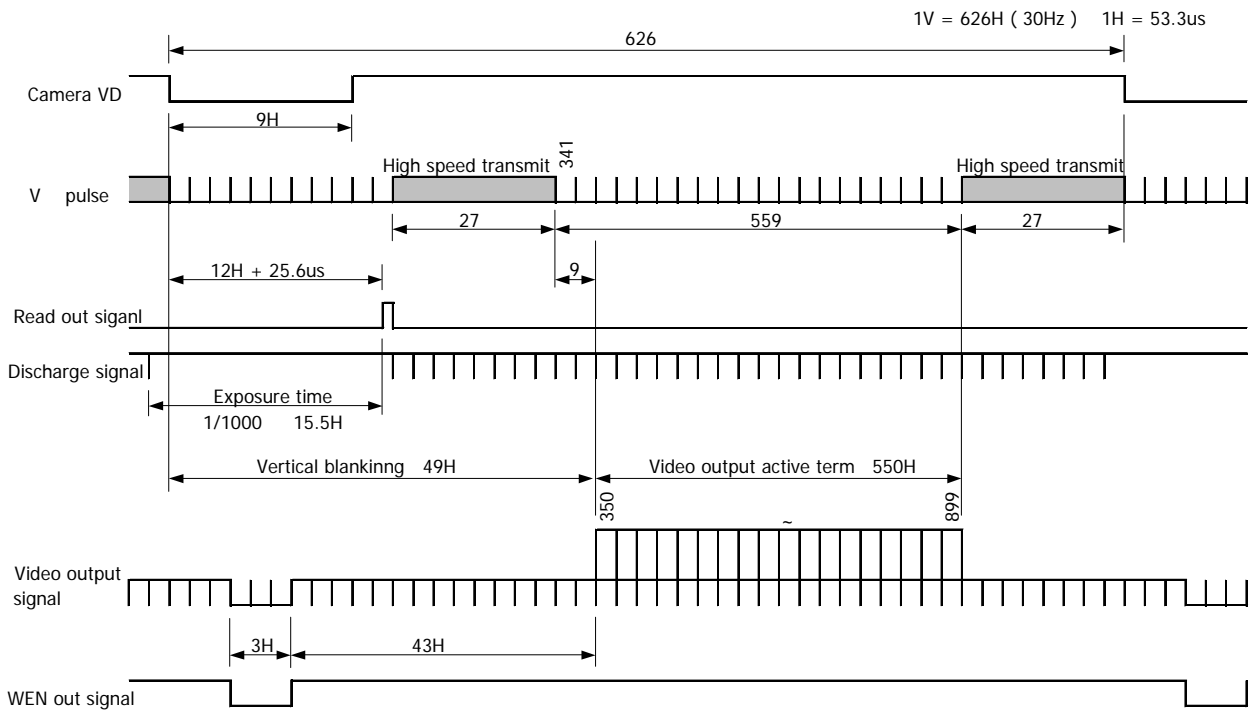
### 10.2. Vertical Synchronous Timing of Full Frame Scan



### 10.3. Vertical Synchronous Timing of Binning Scan

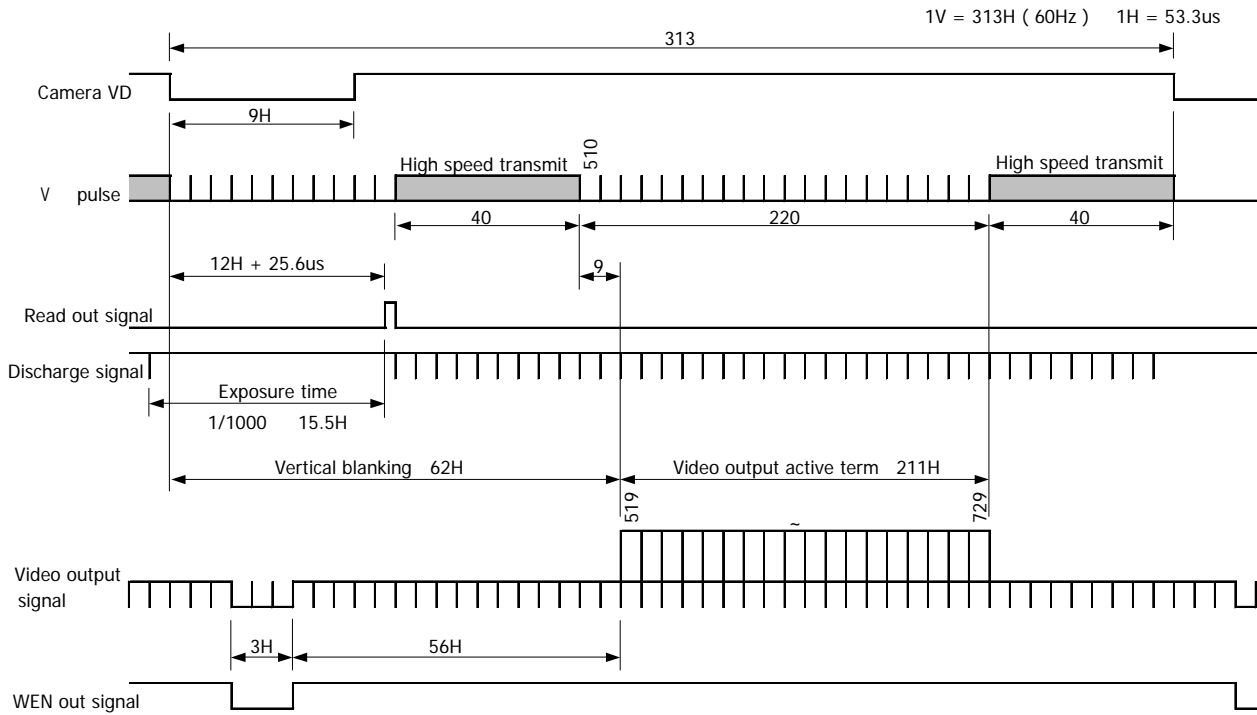


### 10.4. Vertical Synchronous Timing of 1/2 Scan

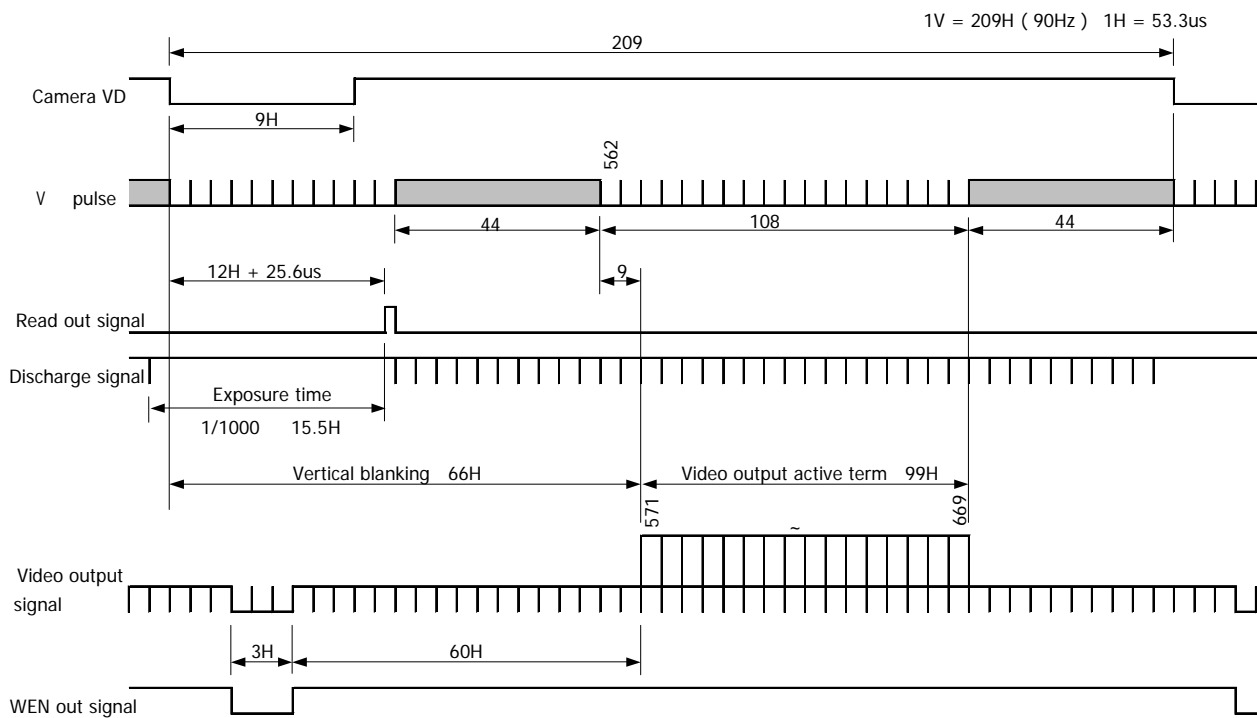




### 10.5. Vertical Synchronous Timing of 1/4 Scan

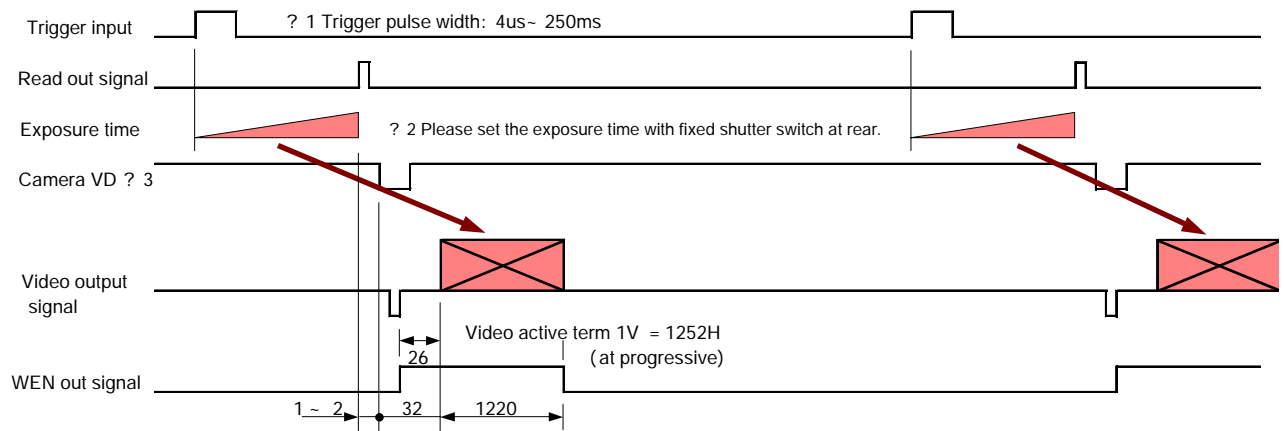


### 10.6. Vertical Synchronous Timing of 1/6 Scan



## 10.7. External Trigger Operation Timing by Fixed Switch Shutter Setup (Sync Reset Type)

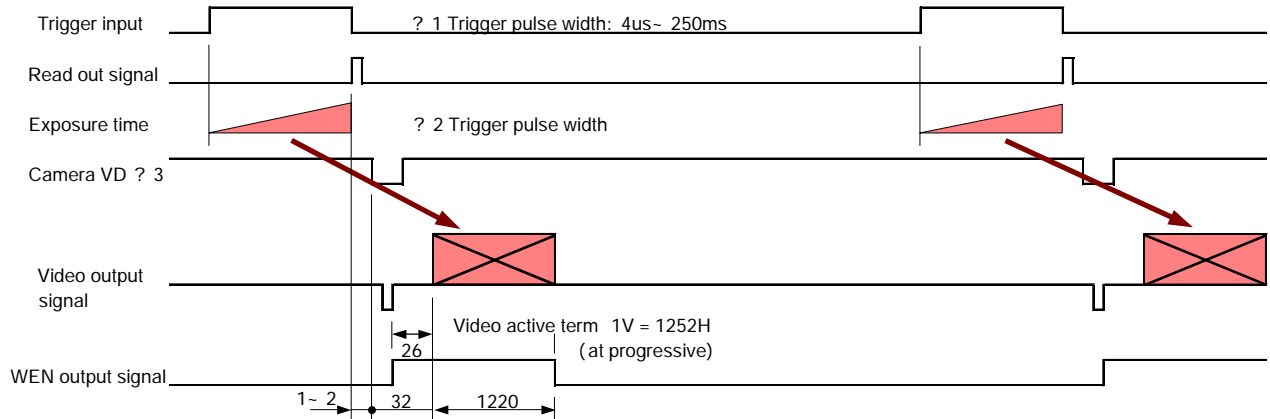
Trigger operation without external VD input.



- ? 1 Input interval shall be over  $1V+4H$  and trigger input width shall be from  $4\mu s$  to  $250ms$ .  
With reset action, images can be outputted at the shortest timing. The next trigger shall not be input before completion of the prior trigger.
- ? 2 Please set the exposure time with fixed shutter switch at rear.  
Exposure time is determined by fixed shutter switch.
- ? 3 External HD can be input, but External VD input can not be input.  
When using HD/VD output, please set SW10 to be OFF.

## 10.8. External Trigger Operation Timing by Pulse Width Setup (Sync Reset Type)

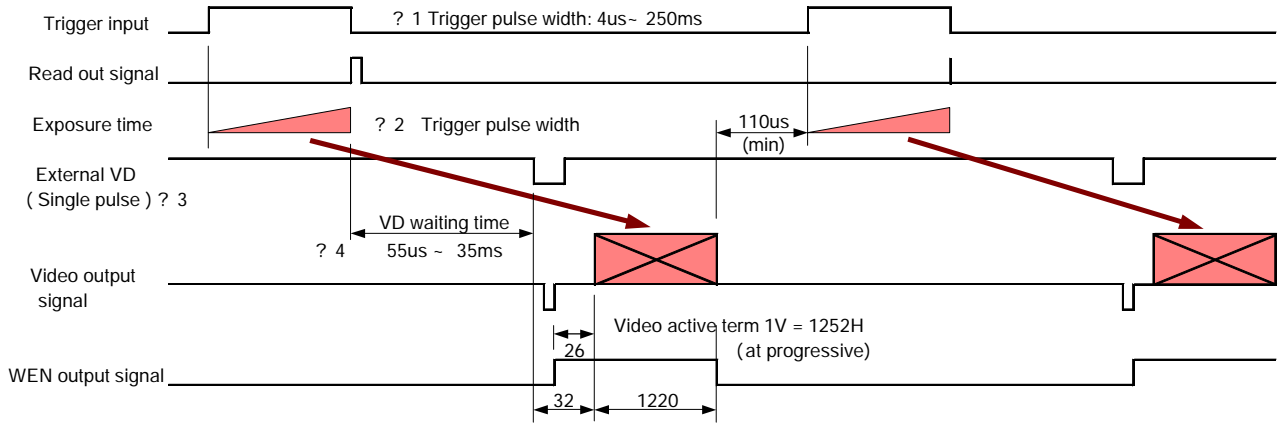
Trigger operation without External VD input.



- ? 1 Input interval shall be over  $1V+4H$  and trigger input width shall be from  $4\mu s$  to  $250ms$ .  
With reset action, images can be outputted at the shortest timing. The next trigger shall not be input before completion of the prior trigger.
- ? 2 Exposure time is determined by trigger input width.  
 $\text{Approx. Exposure time} = \text{Trigger width} (\mu s) + 4.87\mu s$ .
- ? 3 External HD can be input but External VD can not be input.  
When using HD/VD output, please set SW10 to be OFF.

### 10.9. External Trigger Operation Timing by Pulse Width Setup (Sync Non-Reset Type)

Trigger operation without external VD/HD input except trigger input



- ? 1 Trigger pulse width input shall be within 4us ~ 250ms.  
The next trigger shall not be input before completion of the prior trigger .
- ? 2 Exposure time is determined by the input trigger width.  
**Approx. Exposure time = Trigger input width(us) + 4.87us**
- ? 3 The phase of falling edge of the external input of single pulse EXT\_VD and EXT\_HD should match.
- ? 4 The interval from falling edge of trigger input to EXT\_VD input should be between 55us to 35ms.

## 11. Cases for Indemnity (Limited Warranty)

We shall be exempted from taking responsibility and held harmless for damage or losses incurred by the user in the following cases.

- In case damage or losses are caused by fire, earthquake, or other acts of God, acts by third party, deliberate or accidental misuse by the user, or use under extreme operating conditions.
- In case indirect, additional, consequential damages (loss of business interests, suspension of business activities) are incurred as result of malfunction or non-function of the equipment, we shall be exempted from responsibility for such damages.
- In case damage or losses are caused by failure to observe the information contained in the instructions in this product specification & operation manual.
- In case damage or losses are caused by use contrary to the instructions in this product specification & operation manual.
- In case damage or losses are caused by malfunction or other problems resulting from use of equipment or software that is not specified.
- In case damage or losses are caused by repair or modification conducted by the customer or any unauthorized third party (such as an unauthorized service representative).
- Expenses we bear on this product shall be limited to the individual price of the product.

## 12. Handling Precautions

**【Important】** Please observe all warnings and cautions stated below. Our warranty does not apply to damages or malfunctions caused by neglecting these precautions.

- Do not use or store the camera in the following extreme conditions:
  - Extremely dusty or humid places.
  - Extremely hot or cold places (Operating temperature -5 to + 45 ).
  - Close to generators of powerful electromagnetic radiation such as radio or TV transmitters.
  - Places subject to fluorescent light reflections.
  - Places subject to unstable (flickering, etc.) lighting conditions.
  - Places subject to strong vibration.
- Remove dust or dirt on the surface of the lens with a blower.
- Do not apply excessive force or static electricity that could damage the camera.
- Do not shoot direct images that are extremely bright (eg. light source, sun, etc.), and when camera is not in use, put the lens cap on.
- Follow the instructions for connecting the camera. Improper connection may cause damages not only to the camera but also to the connected devices.
- Confirm the mutual ground potential carefully and then connect the camera to monitors or computers. AC leaks from the connected devices may cause damages or destroy the camera.
- Do not apply excessive voltage. (Use only the specified voltage.) Unstable or improper power supply voltage may cause damages or malfunction of the camera.
- Make sure that the camera and peripheral equipments are properly connected before turning the camera on. Especially in INT/EXT sync signal settings, improper connection may cause damages to the camera and the connected devices.
- Make sure to wait for over 2 seconds before rebooting.
- In case of abnormal operation, contact the distributor from whom you purchased the product.